

1. INTRODUCTION

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Shared Strategy for Puget Sound has convened a broad effort to prepare a recovery plan for Puget Sound salmon and bull trout. As participants in this effort we share a vision of self-sustaining harvestable Puget Sound salmon. While we recognize the perilous nature of the current situation, we share the hopeful spirit embodied in this vision of the region's future. We have worked with Shared Strategy staff, technical advisors, and a policy advisory group (aka the Nearshore Policy Group or NPG) to develop this background document on nearshore and marine aspects of salmon recovery. We hope it will be a meaningful contribution to the Shared Strategy's recovery planning effort.

1.1 Statements of premise: our basis for regional assessment of nearshore and marine aspects of salmon recovery

We assert that the Puget Sound region's salmon recovery efforts must include attention to nearshore and marine environments because:

- The viability of Puget Sound salmon and bull trout must be improved. Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Hood Canal summer chum salmon (*Oncorhynchus keta*), and Coastal and Puget Sound bull trout (*Salvelinus confluentus*) are listed as threatened under the federal Endangered Species Act (ESA). This designation reflects a scientific and policy conclusion that biologically significant groups of these fish are at risk of becoming endangered (i.e., in danger of extinction throughout all or a significant portion of their range) in the foreseeable future and that existing management efforts are not sufficient to address this threat.
- Salmon and bull trout, including the species groups designated as threatened, rear in and move through Puget Sound's nearshore and marine environments year-round and rely on these environments to complete their life cycle. Nearshore and marine environments support today's salmon and bull trout populations; they will also be needed to support the recovered populations of the future.
- Nearshore and marine environments of Puget Sound have been greatly altered from their condition prior to settlement of the Puget Sound region by people of European descent. The loss of habitat functions resulting from these alterations is thought to be one factor in the decline of the region's salmon and bull trout populations.
- Puget Sound environments will be altered further as the region's human population continues to grow. Alterations to support new industrial, commercial, and residential activities and development could lead to additional degradation of nearshore and marine habitats as the Puget Sound shoreline continues to be the focus of land development and an intensification of human activities.

We further assert that a regional evaluation of the nearshore and marine aspects of Puget Sound salmon recovery is needed to account for the mingling of salmon populations along the shore and in the waters of Puget Sound. This document reflects our pursuit of this regional evaluation as a complement to the local watershed-scale and population-focused planning around which Shared Strategy is built. Shared Strategy's approach to recovery planning emphasizes the development of plans for protection and restoration at the scale of the watersheds, many of which represent the spawning territories of independent populations of Chinook salmon. Planning at that scale is logical to encourage a focus on the viability of individual populations but is not optimal for understanding recovery needs and strategic opportunities across the nearshore and marine landscape where fish from multiple populations intermingle.

In addition to the two assertions presented above, our efforts to develop this document as a contribution to the Shared Strategy recovery plan were also guided by the following premises:

- A variety of ongoing protection and restoration initiatives in the region can be adapted to support salmon recovery. The State of Washington, local and tribal governments, federal agencies, and a diversity of non-governmental organizations, have developed programs and projects to positively affect the future landscape and environmental conditions in and around Puget Sound. A few of these initiatives are focused specifically on salmon conservation or recovery, but most of them are more general or reflect a different specific focus. Nearshore and marine aspects of salmon recovery in the Puget Sound region will be most effective and efficient if it can build upon the authorities and capacities of these existing efforts.
- A management approach that combines (elements of) the precautionary principle and adaptive management will allow us to preserve options for the future, make wise use of limited resources, and develop and apply new information to improve recovery strategies and actions over time. The Puget Sound Technical Recovery Team (TRT) and Shared Strategy watershed guidance encourages the development of a monitoring and adaptive management plan (i.e., learning-evaluation-adaptation cycle) as an element of a salmon recovery plan. The TRT's evaluation of draft recovery plan chapters (e.g., December 20, 2004 comments on a draft regional nearshore chapter) suggests that we can preserve options in our approach to salmon recovery (and thereby increase the certainty of recovery) if we: (1) protect existing salmon viability and opportunities to improve conditions in the future; and (2) develop and implement a program of monitoring and adaptive management.

1.2 The scope and scale of our effort

The scope of this document can be delimited along dimensions geographical and biological scope (what area? which fish?) and scale (what are the units of analysis?). Our efforts to build this document were constrained along each of these dimensions.

Geographical and biological scope. The Puget Sound basin encompasses the entire evolutionary significant units (ESUs) for Puget Sound Chinook salmon and Hood Canal summer chum salmon, as well as a significant portion of the Distinct Population Segment (DPS) of Coastal-

Puget Sound bull trout. This chapter focuses on recovery of these three groups of fish, and most of the analyses and attention are focused on Chinook, as they rear in and migrate through the nearshore and marine areas of the Puget Sound basin (Figure 1-1). While the basin includes U.S. and Canadian shorelines and waters, we restricted our analyses to only the U.S. portion of the basin.

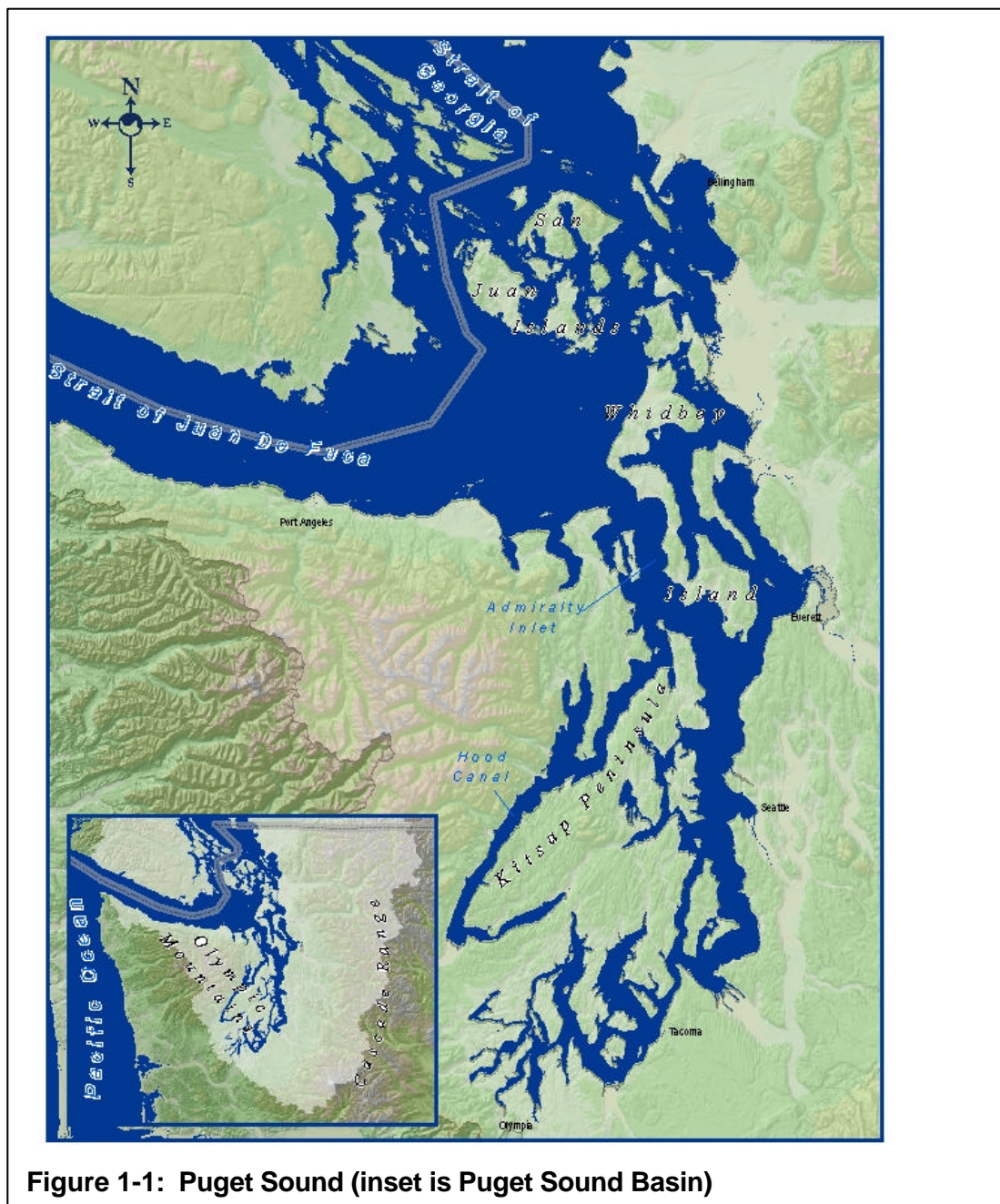


Figure 1-1: Puget Sound (inset is Puget Sound Basin)

This document does not specifically address the nearshore and marine life stages of other salmonids. The three groups of fish designated as threatened and specifically evaluated in this

document, are among the salmon species most dependent on regional nearshore and marine resources for rearing as outmigrants (Chinook and chum) and as resident sub-adults or adults (Chinook and bull trout).

For this document we define nearshore as the zone of interface among the open waters of Puget Sound, the freshwaters of rivers and streams, the air, and the land. The aquatic portion of the nearshore extends up rivers and streams to the upstream limit of tidal influence, along the shoreline at the line of extreme high water, and out to the 20 meter bathymetric contour, which we mean to include the area of marine bedlands that receive sufficient sunlight to (potentially) support the growth of attached algae. The nearshore also includes upland and backshore areas that directly influence conditions in this aquatic region. This chapter also deals with the deeper marine waters of Puget Sound, defined to include all the waters connected to the Pacific Ocean through the straits of Juan de Fuca and Georgia.

Scale. The scale of the analysis used in developing this chapter is more fully described in later sections, but some key features are identified here:

- The listed units or segments of Chinook, chum, and bull trout are described in sub-units of population (i.e., 22 independent populations of Puget Sound Chinook salmon and eight populations of Hood Canal summer chum) or core area (i.e., 11 of the 14 core areas of the Coastal-Puget Sound DPS occur in what we define as the Puget Sound region). Although we acknowledge the significance of the population as the unit for measuring viability, we have not conducted extensive analysis at this level of detail. The populations and core areas are introduced in Section 3.
- Where applicable, we analyzed distinct life history types related to the (early stages of the) marine portion of the anadromous life cycle of these fish. The life history types used in this documents are introduced and discussed in Section 3.
- The landscape of Puget Sound's nearshore and marine environments can be viewed and analyzed at various scales. In this document, we develop and apply a subdivision of Puget Sound nearshore and marine environments into marine sub-basins, landscape classes, and habitat features. These subdivisions are introduced in Section 2.

1.3 The conceptual basis for our assessment and recovery hypotheses and strategies

One of us (Fresh) has proposed a conceptual model¹ of salmon interactions with nearshore and marine ecosystems as they are influenced by people. This model frames and organizes our work to assess the current situation and develop recovery hypotheses and strategies. Our adaptation of this model (Figure 1-2) indicates how salmon and bull trout population viability depends on and is affected by ecosystem processes, the resulting habitat attributes, and human-related stressors that can impair these processes or habitats.

¹ Based upon an ecosystem-based model that is being used to organize and structure research efforts by the Watershed Program at the Northwest Fisheries Science Center (Beechie et al., 2003).

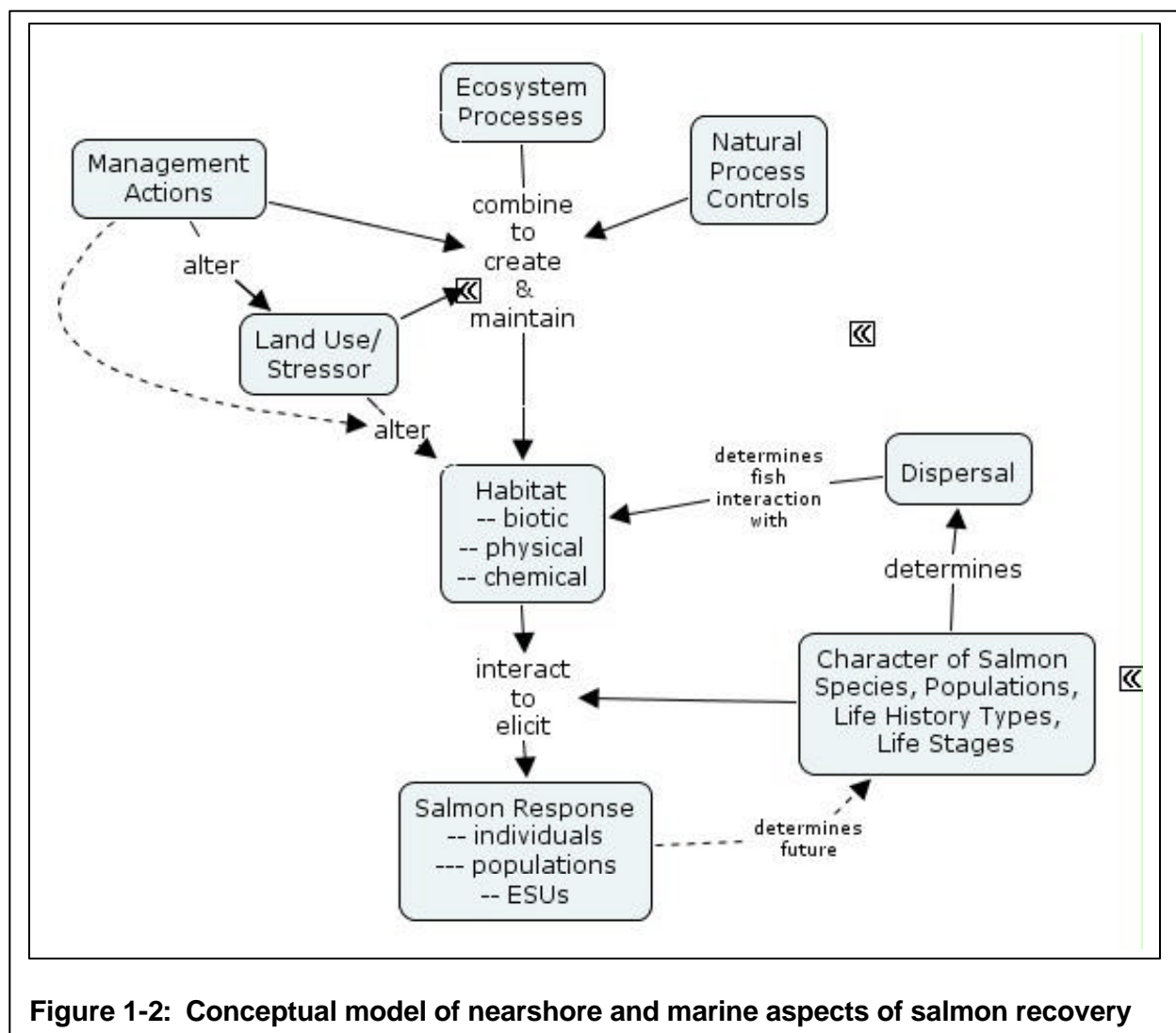


Figure 1-2: Conceptual model of nearshore and marine aspects of salmon recovery

The upper right and center portion of the model depicts connections among nearshore and marine ecosystem processes and natural controls on these processes, and the physical, chemical, and biological habitat features available to support salmon and bull trout in Puget Sound nearshore and marine environments. Our elaboration on this portion of the model in Section 2 emphasizes that nearshore and marine habitat features arranged on the landscape of Puget Sound reflect, and result from, the interplay of ecosystem processes (e.g., movement of fresh water, ocean water, sediment, and organic material) and natural controls on these processes (e.g., global climate and ocean variability, geomorphology).

The lower right portion of the model depicts relationships among habitat features and the dispersal and response of salmon individuals and populations. This section of the model emphasizes the interplay of the diversity of salmon (reflected in differences among species, populations, and within populations) and the nearshore and marine habitat features they (might) access to support their growth and survival. Section 3 of this chapter provides a detailed review of salmon-habitat relationships in Puget Sound nearshore and marine environments.

The upper left portion of the model describes how human land uses and human activities (stressors and management activities) can affect nearshore and marine ecosystem processes and habitat features. Specific connections from this area of the model to the salmon portion of the model are described in Section 4 of this chapter; these relationships between the realms of human activity and salmon population response suggest avenues by which humans can positively and negatively influence salmon and bull trout populations.

1.4 Some general goals/strategies for nearshore and marine aspects of Puget Sound salmon and bull trout recovery

Based on the statements of premise and general understandings presented above, the NPG outlined three goals or strategies for the regional nearshore and marine work on Puget Sound salmon recovery:

Goal 1. Protect key nearshore and marine ecosystem features and processes to maintain the viability of salmon and bull trout populations while also supporting other interests that depend on the marine shorelines and waters of Puget Sound.

Goal 2. Restore and enhance key nearshore and marine ecosystem features and processes to improve the viability of salmon and bull trout populations while also supporting other interests that depend on the marine shorelines and waters of Puget Sound.

Goal 3. Increase the certainty of recovery for Puget Sound salmon and bull trout populations by improving the body of knowledge about salmon and bull trout requirements of nearshore and marine environments and the effects of human activities on these environments and on the viability of the salmon and bull trout.

1.5 Our approach to developing recovery hypotheses and strategies and developing an adaptive management plan

The next sections of this document:

- provide details about various aspects of our conceptual model of salmon recovery in nearshore and marine environments (sections 2 through 4);
- present our recovery hypotheses (Section 5);
- evaluate salmon-specific needs and protection and restoration opportunities in 11 marine sub-basins of Puget Sound (Section 6);
- propose recovery goals and strategies relevant to nearshore and marine aspects of salmon recovery (Section 7); and
- propose a collaborative process for deciding on actions and instituting an adaptive management process (Section 8).

The information (and uncertainties) developed in sections 2 through 4 of this chapter provide the foundation for specifying recovery hypotheses, which we present in Section 5. These hypotheses highlight and clearly state the key elements of the logical framework that we suggest to achieve salmon recovery. Discussion of these hypotheses also addresses the relative level certainty in the various elements of this framework.

We use these recovery hypotheses to guide a life-stage and spatially-explicit evaluation of the key opportunities to support population and ESU recovery in each of 11 marine sub-basins in Puget Sound. These evaluations, which are presented in Section 6, overlay the hypotheses described in Section 5 with a fairly rudimentary characterization of the salmon and ecological and landscape conditions of each sub-basin. By completing these evaluations across the entire landscape of Puget Sound, we see patterns that help us articulate more specific goals and strategies for regional nearshore and marine aspects of salmon recovery.

Sections 2 through 6 then set the stage for our articulation, in Section 7, of recovery objectives following the three goals stated above and building from the accumulated information on nearshore ecosystems and salmon and bull trout populations. In Section 7, we also articulate general strategies that will move us toward our goals and objectives by building on a foundation of existing management approaches, recovery hypotheses, and spatially explicit evaluations of opportunities for recovery in Puget Sound nearshore and marine environments.

Finally, in Section 8 we propose an approach to adaptively develop and manage sub-basin-scale, 10-year (and longer) action plans to address nearshore and marine aspects of Puget Sound salmon recovery. Unlike the local chapters of the regional recovery plan, we have not attempted to include a 10-year action plan, including commitments to implement actions, in this document. Instead, we describe a suite of very near term actions that are already underway to advance the strategies and suggest a collaborative process for developing sub-basin plans for 10-years (and longer) that presumes continued learning and adaptation of hypotheses, strategies and actions. We have pursued this course because:

- Our work to develop the technical basis for our recovery hypotheses and strategies continued into April 2005;
- We have not yet succeeded in convening or consulting with the decision-makers who might have the authority and resources to enact many of the ideas we are suggesting;
- Identification of region-scale priorities and actions includes issues (e.g., habitat protection, water quantity) that reach beyond nearshore and marine aspects of salmon recovery; and
- Identification of sub-basin priorities and actions should reconcile nearshore and marine elements of watershed-scale plans and the recommendations and proposals in this document.